

## SIGNIFICANT FIGURES

DIGITS IN A REPORTED MEASUREMENT ARE CALLED  
**SIGNIFICANT FIGURES.**

1.78 g has 3 sf

43. ml has 2 sf

22.0 mL has 3 sf and volume of sample lies between 21.95 mL and 22.05 mL.

50.00 g =  $5.000 \times 10^1$  g and has 4 sf

0.00501 m =  $5.01 \times 10^{-3}$  m and has 3 sf

IN CALCULATIONS (MULTIPLICATION & DIVISION) MEASURED VALUE WITH LEAST sf DETERMINES sf IN ANSWER, AND ONE MUST ROUND OFF.

INTEGERS AND EXACT NUMBERS DO NOT AFFECT sf :

BY DEFINITION, 1 in. IS EXACTLY 2.54 cm AND 273.15 K IS 0 °C

∴ 100.000 °C CONVERTS TO 373.150 K

### ADDITION & SUBTRACTION:

NUMBER OF DECIMAL PLACES IN ANSWER =  
SMALLEST NUMBER OF DECIMAL PLACES IN THE DATA

$$1000.1\text{g} + 7.34\text{g} = 1007.44\text{g} = 1007.4\text{g}$$

BUT FOR MULTIPLICATION & DIVISION USE sf:

$$\frac{1007.44\text{ g}}{1.23\text{ mol}} = 819.0569\text{ g}\cdot\text{mol}^{-1} = 819\text{ g}\cdot\text{mol}^{-1}$$

MOST CALCULATIONS REQUIRE MULTIPLICATION & DIVISION

## RULES FOR ROUNDING OFF:

- DO IT AT END OF CALCULATION IN ONE STEP
- IF LAST DIGIT IS ABOVE 5: ROUND UP (2 sf then 2.36 is 2.4)
- IF LAST DIGIT IS BELOW 5: ROUND DOWN (1sf then 2.36 is 2)
- IF LAST DIGIT IS 5: ROUND TO NEAREST EVEN NUMBER  
(2 sf then 2.35 is 2.4 and 2.65 is 2.6)

Note: Round to the nearest even digit if there is nothing after the 5, but round up if there are digits after the 5. For example if we round to 2 significant figures:  $2.451 \times 10^2$ , the answer is  $2.5 \times 10^2$  since  $2.451 \times 10^2$  is closer to  $2.5 \times 10^2$  than  $2.4 \times 10^2$ .

## LOGARITHMS:

$$\text{LOG } 1.5 \times 10^2 = 2.18$$

$$\text{BECAUSE } 10^{2.18} = 10^{0.18+2} = 10^{\underline{0.18}} \times 10^2 = \underline{1.5} \times 10^2$$

                  ↑    ↑  
                  MANTISSA    CHARACTERISTIC

SF IN MANTISSA = SF IN DECIMAL NUMBER = 2

$$\text{LOG } 4.33 \times 10^{-5} = -4.364$$

$$10^{-4.364} = 10^{-0.364-4} = 10^{-\underline{0.364}} \times 10^{-4} = \underline{0.433} \times 10^{-4} = \underline{4.33} \times 10^{-5}$$

SF IN MANTISSA = SF IN DECIMAL NUMBER = 3

$$10^{11.68} = 4.8 \times 10^{11} \text{ (MANTISSA 0.68 HAS 2 SF) DECIMAL HAS 2 SF}$$

## MORE EXAMPLES:

100.14% HAS 5 sf

100. g and 156. g both have 3sf.

The 'clarity' of scientific notation is very useful because 100. g when written as  $1.00 \times 10^2$  is unambiguous, and it has 3sf.